

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (currently amended): A light-emitting diode comprising a light-emitting diode chip mounted on a surface of a printed substrate, the light-emitting diode chip including:

a transparent substrate;

a semiconductor layer laminated on the transparent substrate and formed of an N-type semiconductor layer and a P-type semiconductor layer, wherein its PN junction surface interface is perpendicular to the surface of the printed substrate and a portion in the vicinity of the PN junction surface interface is rendered to be a light-emitting portion;

a pair of electrodes for applying voltage to the semiconductor layer; and

a light reflecting layer for reflecting light emitted from the light-emitting portion,

wherein the light reflecting layer is formed of a metal thin film on a front surface or a back surface of the light-emitting diode chip or in the light-emitting diode chip and is approximately parallel to the PN junction surface, and one of the electrodes is formed above the semiconductor layer via the light reflecting layer.

Claim 2 (currently amended): A light-emitting diode claimed in Claim 1, wherein [the substrate is made of a transparent substrate and] the light reflecting layer is formed on the front surface or back surface of the transparent substrate or on the surface of the semiconductor layer.

Claim 3 (original): A light-emitting diode claimed in Claim 2, wherein the light reflecting layer comprises a DBR diffraction grating structure formed on the surface of the transparent substrate.

Claim 4 (canceled)

Claim 5 (currently amended): A light-emitting diode claimed in Claim 1 ~~Claim 4~~, wherein the metal thin film is formed directly or via a dielectric thin film on the back surface of the transparent substrate.

Claim 6 (currently amended): A light-emitting diode claimed in Claim 1 ~~Claim 4~~, wherein the metal thin film is formed of an Ni vapor-deposition film.

Claim 7 (currently amended): A light-emitting diode claimed in Claim 5, wherein the dielectric thin film is formed of an SiO₂ film or an Al₂O₃ film, and the metal thin film is formed of an AuBe vapor-deposition film or an Au vapor-deposition film via the dielectric thin film, and the electrodes are formed on the front surface side and back surface side, respectively, of the transparent substrate.

Claim 8 (currently amended): A light-emitting diode claimed in Claim 1, wherein the ~~Ni vapor-deposition~~ metal thin film has a thickness of 100 nm or more.

Claim 9 (original): A light-emitting diode claimed in Claim 7, wherein the SiO₂ film or the Al₂O₃ film has a thickness of approximately 3 to 60 nm, and the AuBe vapor-deposition film or the Au vapor-deposition film has a thickness of approximately 3 to 60 nm.

Claim 10 (currently amended): A light-emitting diode claimed in Claim 1, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.

Claim 11 (withdrawn): A method for manufacturing a light-emitting diode comprising mounting, on a surface of a printed substrate, a light-emitting diode chip having a substrate, a semiconductor layer which is laminated on a surface of the substrate, is formed of an N-type semiconductor layer and a P-type semiconductor layer and has a light-emitting portion in the vicinity of a PN junction surface between the N-type and P-type semiconductor layers, a pair of

electrodes for applying voltage to the semiconductor layer, and a light reflection layer reflecting light emitted from the light-emitting portion, thereby obtaining the light-emitting diode, the method comprising, for mounting the light-emitting diode chip on the printed substrate,

the step of forming beforehand the light reflecting layer on a front surface or a back surface of the substrate of the light-emitting diode chip or in the light-emitting diode chip in such a manner that the light reflecting layer is approximately parallel to the PN junction surface, and

the step of fixing the obtained light-emitting diode chip on the printed substrate so that the PN junction surface is perpendicular to the surface of the spring substrate and electrically connecting the pair of electrodes of the light-emitting diode chip to the printed substrate.

Claim 12 (canceled)

Claim 13 (original): A light-emitting diode claimed in Claim 5, wherein the metal thin film is formed of an Ni vapor-deposition film.

Claim 14 (currently amended): A light-emitting diode claimed Claim 2, wherein the ~~Ni vapor-deposition~~ metal thin film has a thickness of 100 nm or more.

Claim 15 (currently amended): A light-emitting diode claimed in Claim 3, wherein the ~~Ni vapor-deposition~~ metal thin film has a thickness of 100 nm or more.

Claim 16 (cancelled)

Claim 17 (currently amended): A light-emitting diode claimed in Claim 5, wherein the ~~Ni vapor-deposition~~ metal thin film has a thickness of 100 nm or more.

Claim 18 (original): A light-emitting diode claimed in Claim 6, wherein the Ni vapor-deposition film has a thickness of 100 nm or more.

Claim 19 (currently amended): A light-emitting diode claimed in Claim 7, wherein the ~~Ni vapor-deposition~~ metal thin film has a thickness of 100 nm or more.

Claim 20 (currently amended): A light-emitting diode claimed in Claim 2, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.

Claim 21 (currently amended): A light-emitting diode claimed in Claim 3, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.

Claim 22 (canceled)

Claim 23 (currently amended): A light-emitting diode claimed in Claim 5, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.

Claim 24 (currently amended): A light-emitting diode claimed in Claim 6, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.

Claim 25 (currently amended): A light-emitting diode claimed in Claim 7, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.

Claim 26 (currently amended): A light-emitting diode claimed in Claim 8, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.

Claim 27 (currently amended): A light-emitting diode claimed in Claim 9, wherein the transparent substrate is ~~formed of a transparent substrate~~ transparent to color emitted by the light-emitting diode chip.